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Title: STATISTICAL SOUND EVENT MODELING SYSTEM AND METHODS

Mail Stop Appeal Brief - Patents
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APPEAL BRIEF

(1) Real Party in Interest

The real party in interest is Analog Devices, Inc., assignee of the invention and application.

(2) Related Appeals and Interferences

None.

(3) Status of Claims

Claims 1-5, 9-14 and 16-50 have been rejected.

Claims 6-8 have been allowed.

Claim 15 has been cancelled.

(4) Status of Amendments

No amendments have been filed subsequent to the close of prosecution.

(5) Summary of Claimed Subject Matter

Claim 1

Claim 1 is directed to a method of synthesizing a complex sound that sounds neither looped nor repetitive, for applications such as computer games, multimedia exhibits and music synthesis (page 5, lines 5-10), comprising:

generating a plurality of different kinds of simpler sound events in a sequence of simpler sound events (page 5, lines 10-18; page 6, lines 15-18; FIGs. 1, 2, 5A, 5B,6 "Trigger Process"), with repetitive occurrences of at least some of said kinds (page 3, lines 25-29; page 5, lines 10-18), and with random time delays after a simpler sound event is generated until the next simpler sound event is generated (page 6, lines 24-26; page 7, lines 3-8; page 8, line 3 - page 9, line 14; FIG. 3A "Noise, Zero-Crossing Detector"; FIG. 3B "Choose Δt with a random distribution, Delay by Δt"), and

combining said successive simpler sound events into said complex sound (page 1, lines 23-24; page 3, lines 7-11, 25-26; page 5, lines 10-12; page 6, lines 21-23; page 14, lines 11-13; FIG. 1 "Playback Engine").

Claim 35

Claim 35 is directed to a method of synthesizing a complex sound event, comprising;

generating a sequence of simpler sound events with random time delays after a simpler sound event is generated until the next simpler sound event is generated (page 6, lines 24-26; page 7, lines 3-8; page 8, line 3 - page 9,

line 14; FIG. 3A "Noise, Zero-Crossing Detector"; FIG. 3B "Choose Δt with a random distribution, Delay by Δt"),

controlling said simpler sound events in accordance with one or more sound event parameters (page 6, lines 18-23, 26-28; page 6, line 31 - page 7, line 3; page 7, lines 15-30; page 8, lines 10-15; page 13, lines 19-21; FIGs. 1, 5A, 5B "Parameter Selectors", "Parameters"),

selecting the values of said sound event parameters in accordance with respective input parameters having random distributions (page 4, lines 1-7; page 6, lines 18-21; page 7, line 30 - page 8, line 1; page 8, lines 15-21; page 11, lines 10-15; FIGs. 4, 5A, 5B "Parameter Selector"), and

combining said simpler sound events into said complex sound (page 1, lines 23-24; page 3, lines 7-11, 25-26; page 5, lines 10-12; page 6, lines 21-23; page 14, lines 11-13; FIG. 1 "Playback Engine").

Claim 49

Claim 49 is directed to a method of synthesizing a complex sound, comprising:

generating a plurality of different kinds of simpler sound events in a sequence of simpler sound events with respective delays between the trigger times of successive simpler sound events in said sequence (page 6, lines 15-18; FIGs. 1, 2, 5A, 5B, 6 "Trigger Process"), and with repetitive occurrences of each kind (page 3, lines 25-29; page 5, lines 10-18),

establishing respective time delays between the trigger times of at least some of said kinds of simpler sound events independent of the durations of said simpler

sound events, and independent of the kinds of simpler sound events embodied by said at least some simpler sound events (page 6, lines 24-26; page 7, lines 3-8; page 8, line 3 - page 9, line 14; FIG. 3A "Noise, Zero-Crossing Detector"; FIG. 3B "Choose Δt with a random distribution, Delay by Δt"), and

combining said simpler sound events into said complex sound (page 1, lines 23-24; page 3, lines 7-11, 25-26; page 5, lines 10-12; page 6, lines 21-13; page 14, lines 11-13; FIG. 1 "Playback Engine").

<u>Claim 50</u>

Claim 50 is directed to a method of synthesizing a complex sound event, comprising:

generating a succession of simpler sound events with random time delays, after a simpler sound event is generated until the next simpler sound event is generated, that are independent of the respective durations of said simpler sound events (page 6, lines 24-26; page 7, lines 3-8; page 8, line 3 - page 9, line 14; FIG 3A "Noise, Zero-Crossing Detector"; FIG. 3B "Choose Δt with a random distribution, Delay by Δt"),

controlling said simpler sound events in accordance with one or more sound event parameters (page 6, lines 18-13, 26-28; page 6, lines 31 - page 7, line 3; page 7, lines 15-30; page 8, lines 10-15; page 13, lines 19-21; FIGs. 1, 5A, 5B "Parameter Selectors", "Parameters"), and

selecting the values of said sound event parameters in accordance with respective input parameters that have random distributions (page 4, liens 1-7; page 6, lines 18-21; page 7, line 30 - page 8, lines 1; page 8, lines 15-21;

page 11, lines 10-25; FIGs. 4, 5A, 5B, "Parameter Selectors").

(6) Issues to be Reviewed on Appeal

(a) Are claims 1-4, 9-14, 16-18, 21-26 and 28-50 patentable under 35 U.S.C. 102(b) over Patent No. 5,832,431 to Severson et al. (Severson et al. ('431))?

(b) Is claim 5 patentable under 35 U.S.C. 103(a) over Severson et al ('431) in view of Patent No. 6,215,874 to Borga et al.?

(c) Are claims 19, 20 and 27 patentable under 35 U.S.C. 103(a) over Severson et al. ('431) is view of Patent No. 5,267,318 to Severson et al. (Severson et al. ('318))?

(7) Argument

(a) Are claims 1-4, 9-14, 16-18, 21-26 and 28-50 patentable over 35 U.S.C. 102(b) over Severson et al. ('431)?

(i) Claims 1-4, 9, 11-14 and 29-46

Rejected claims 1-4, 9, 11-14 and 29-34 all call for "…generating a plurality of simpler sound events in a sequence of simpler sound events, with repetitive occurrences of at least some of said kinds, and with at least some kinds of said simpler sound events in said sequence having random time delays between their initiations…", either directly for claim 1, or through a dependency from claim 1. Claim 35, and by incorporation its dependent claims 36-46, employ similar language but do not include the requirement for "repetitive occurrences of for at least some of said kinds" (of simpler sound events).

The Examiner apparently interpreted the phrase "random time delays" in both claims 1 and 35 as applying to the Severson et al. ('431) technique (described at column 5, lines 13-30) of randomly varying the time delays between sound segments of the same kind. (For purposes of this Amendment, the terminology "simpler sound event" as used in the present application and "sound segment" as used in Severson et al. ('431) may be considered to be interchangeable.)

Although the time between repeats of the <u>same kind</u> of segment is varied randomly in Severson et al. ('431), it is clear from the patent's specification that, for any given segment, the time at which the <u>next</u> segment in the overall sequence begins (regardless of the kind of segment represented by the next segment) is right at the end of the given segment. Accordingly, there is no randomness as to when the next segment occurs in time relative to the immediately preceding segment; randomness attaches only to the time delays between repeats of the <u>same kind</u> of segment.

In Severson et al. ('431) a series of sound segments, which may be chosen randomly, are taken from an otherwise continuous sound and re-assembled into a continuous sound sequence. Each segment begins right after the end of the immediately preceding segment, with no overlaps or gaps between immediately successive segments. By contrast, in the preferred embodiment of the present invention, simple sound events are combined into a complex sound with random time delays between generating a simpler sound event and generating the <u>next</u> simpler sound event in the sequence (not the next segment <u>of the same kind</u> as in Severson et

al. ('431)). This can result in multiple sound events overlapping, or in gaps between successive events, unlike Severson et al. in which the sound segments are continuous and sequential. Although Severson et al. refers to the possibility of "silent pauses" between sound segments, such pauses would be deliberately inserted and not the result of any random selection (column 2, lines 46-48).

A more detailed description of the above summary for the Severson et al. operation is provided in the patent as follows:

-Column 2, lines 33-36: "Then these independent segments are re-assembled into a <u>continuous</u>, never-repeating sound sequence based on selecting the next sound segment according to some statistical algorithm." (emphasis added)

-Column 2, line 60-67: "In general, the method includes… selecting one of the sound segments according to the probably density function; playing the selected sound segment; and repeating said selecting and playing steps thereby generating non-looped continuous sound." (emphasis added)

-Column 8, lines 63-66: "To further increase the depth and realism of <u>continuous</u> sound animation it is possible to have one or more aspects of the sound generation and sequencing be responsive to various events or inputs." (emphasis added)

-Column 11, lines 33-37 (RSS implementation): "When the Digital Sound Generator, 306, is finished with playing out the present sound record, it will accept the new address, and request from Sound Memory, 307, the sound record at the address in Address Latch, 305."

-Column 11, lines 59-61: "If there is more than 1 sound record in the memory, 307, then this embodiment will play a <u>continuous</u> series of sound records that will be randomly sequenced…" (emphasis added)

-Column 14, lines 3-5: "Summary of New Concepts

1. The concept of randomly sequencing a set of sounds to produce a never-repeating <u>continuous</u> sound effect." (emphasis added)

Support for the random distribution of times for the generation of the next simpler sound event, relative to a given simpler sound event, is provided in the present specification as follows:

-Page 6, line 24-26: "The trigger process selects a <u>random time lag between subsequent events</u> that make up the large-scale or complex events." (emphasis added)

-Page 7, lines 3-8: "For example, ambient sound such as cricket chirps are typically generated at a constant average rate. That is, while <u>the time between individual chirps fluctuates randomly</u> to provide a natural environment, the average time between chirps is constant over a large time period." (emphasis added)

-Page 8, line 3 - page 9, line 14: "There are two main embodiments of the trigger process, both of which are characterized by a particular statistical distribution of the time between individual events. In the embodiment of FIG. 3A, the trigger process samples white noise and generates events when a strongly low pass-filtered noise signal crosses zero in an upward-going direction… An alternative embodiment of the trigger process is illustrated in FIG. 3B. In this embodiment, event

generation is based directly on predefined random distribution. After an event is generated, a random generator selects a value of the time delay, Δt until the next event should be generated. After the selected time delay passes, a new event is generated. This new event then triggers the random generator to select a time delay for the next event according to the predefined random distribution. (emphasis added).

Independent claims 1 and 35 require that the simpler sound events be generated in a sequence with random time delays after a simpler sound event is generated until the next simpler sound event is generated. Claims 1 and 35, along with their dependent claims 2-4, 9, 11-14, 29-34 and 36-46, accordingly patentably distinguish over Severson et al. ('431).

(ii) Claim 10

Claim 10 refers to the random time delay to the next successive simpler sound event occurrence. This emphasizes the distinction discussed above over Severson et al. ('431), in which only the delay between sound segments of the same kind are random, with no delay at all between one segment and the next successive segment (regardless of kind).

(iii) Claims 16-18, 21-26 and 28

There is an independent basis of patentability for these claims, which depend (through other claims) from independent claim 1 discussed above, with claims 17, 18, 21-26 and 28 depending from 16. They require that the simpler sound events be characterized by parameters whose values are randomly varied among the simpler sound events,

for at least some kinds of simpler sound events. Examples of such parameters are wave selection, pitch distribution, pan (i.e., left-to-right sound movement) distribution and amplitude (i.e., loudness) distribution (specification page 10, lines 21-24). Neither Severson et al. ('431) nor any other references known to applicants disclose or suggest this feature.

(iv) Claims 47, 48 and 50

Claim 47 depends from claim 1, claim 48 depends from claim 35, and claim 50 is independent. They all require that the random time delays between given simpler time events and the next simpler time events be independent of the durations of the simpler sound events. This is directly opposed to Severson et al. ('431), in which each segment begins at the end of the preceding segment, and the time from one segment to the next is therefore equal to the duration of the first segment, not independent of it.

(v) Claim 49

Claim 49 requires respective time delays between the trigger times of at least some kinds of successive sound events that are independent of the kind of simpler sound events, and that are also independent of the durations of the simpler sound events. In Severson et al. ('431) the trigger time delays are totally dependent upon the durations of the segments, as discussed immediately above in connection with claims 47 and 48. Furthermore, since the duration of a Severson et al. ('431) segment is dependent upon the kind of segment it is, the trigger time delays in Severson et al. ('431) are also dependent upon the kind of segment.

While the preferred embodiment of the present invention utilizes a random time distribution of simpler sound events, it is also possible to have a deterministic distribution (specification page 14, lines 1-6), and in recognition of this claim 49 does not require a random time distribution.

(b) <u>Is claim 5 patentable under U.S.C. 103(a) over Severson et al. '431 in view of Borga et al.?</u>

Claim 5 depends from independent claim 1 which, as discussed above, is patentable over Severson et al. ('431). Since claim 1 is patentable, claim 5 is also patentable.

(c) <u>Are claims 19, 20 and 27 patentable under U.S.C. 103(a) over Severson et al. '431 in view of Severson et al. ('318)?</u>

These claims all depend directly or indirectly from claim 16, which in turn depends from claim 1 (through claim 13). Claims 19, 20 and 27 are accordingly patentable at least for the reasons discussed above in connection with claims 1 and 16.

Respectfully submitted,

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(8) Claims Appendix

1. A method of synthesizing a complex sound, comprising:

generating a plurality of different kinds of simpler sound events in a sequence of simpler sound events, with repetitive occurrences of at least some of said kinds, and with random time delays after a simpler sound event is generated until the next simpler sound event is generated, and

combining said successive simpler sound events into said complex sound.

2. The method of claim 1 wherein, for at least some of said kinds of simpler sound events with random time delays, the average rate of generating said simpler sound event occurrences is constant.

3. The method of claim 1 wherein, for at least some of said kinds of simpler sound events with random time delays, the average rate of generating said simpler sound event occurrences is time varying.

4. The method of claim 3, wherein said time varying average rate combines constant and time varying components.

5. The method of claim 1, wherein said random time delays are established in accordance with white noise crossing a predetermined threshold in a predetermined direction.

9. The method of claim 1, wherein said random time delays are predetermined for at least some of said kinds of simpler sound events.

10. The method of claim 9, wherein a random time delay to the next successive simpler sound event occurrence is selected in response to each simpler sound event occurrence.

11. The method of claim 9, wherein an entire sequence of random time delays between said simpler sound event occurrences is selected prior to generating said simpler sound event occurrences.

12. The method of claim 1, wherein said random time delays are user defined for at least some of said kinds of simpler sound events.

13. The method of claim 1, wherein said simpler sound events with random time delays are characterized by a plurality of different parameters.

14. The method of claim 13, wherein said parameters include one or more of wave selection, pitch distribution, pan distribution and amplitude distribution.

16. The method of claim 13, wherein the values of said parameters are randomly varied among said simpler sound event occurrences for at least some of said kinds of simpler sound events.

17. The method of claim 16, wherein said random variation is user selectable.

18. The method of claim 17, wherein said random variation has a Gaussian distribution with user selectable mean and standard deviation values.

19. The method of claim 16, wherein said parameters have user selectable minimum and maximum values for at least some of said kinds of simpler sound events.

20. The method of claim 19, wherein a new parameter value is randomly selected if a selected parameter value does not fall within said minimum and maximum values.

21. The method of claim 16, wherein the values of said parameters have different respective random distributions for a least some of said kinds of simpler sound events.

22. The method of claim 16, wherein the values of said parameters have the same random distribution for at least some of said kinds of simpler sound events.

23. The method of claim 16, wherein the random distributions for at least some of said parameter values are variable for at least some of said kinds of simpler sound events.

24. The method of claim 23, wherein the average rate of generating said simpler sound event occurrences is time varying, and said variable parameter value random

distributions are varied in accordance with said average rate of generating said simpler sound event occurrences.

25. The method of claim 16, wherein at least some of said parameters are characterized by respective parameter selectors.

26. The method of claim 25, wherein the average rate of generating said simpler sound event occurrences is time varying, and at least some of said variable parameter selectors have random distributions with average values that vary in accordance with the variation in the average rate of generating said simpler sound event occurrences.

27. The method of claim 25, said parameter selectors including mean, standard deviation, minimum and maximum values.

28. The method of claim 27, wherein said parameter selectors vary with time in different respective ways.

29. The method of claim 13, wherein said method is used to generate sounds for a game, and said parameters are varied for at least some of said kinds of simpler sound events in accordance with the occurrence of predetermined game events.

30. The method of claim 13, wherein the values of said parameters are user selectable for at least some of said kinds of simpler sound events.

31. The method of claim 13, wherein at least some of said parameters are characterized by respective random distributions of values having predetermined average values.

32. The method of claim 31, wherein at least some of said predetermined average values are varied during the course of generating a complex sound event.

33. The method of claim 1, wherein said simpler sound events are stored in a digital wavetable synthesizer.

34. The method of claim 1, wherein said simpler sound events are generated by an analog sound synthesizer.

35. A method of synthesizing a complex sound event, comprising:

generating a sequence of simpler sound events with random time delays after a simpler sound event is generated until the next simpler sound event is generated,

controlling said simpler sound events in accordance with one or more sound event parameters,

selecting the values of said sound event parameters in accordance with respective input parameters having random distributions, and

combining said simpler sound events into said complex sound.

36. The method of claim 35, wherein the average rate of generating said simpler sound events is constant.

37. The method of claim 35, wherein the average rate of generating said simpler sound events is time varying.

38. The method of claim 37, wherein said average rate of generating said simpler sound events combines constant and time varying components.

39. The method of claim 35, wherein said sound event parameters comprise one or more of wave selection, pitch distribution, pan distribution and amplitude distribution.

40. The method of claim 39, wherein said input parameters comprise one or more of mean, standard deviation, minimum value and maximum value.

41. The method of claim 35, wherein said input parameters have different random distributions.

42. The method of claim 35, wherein said input parameters have a common random distribution.

43. The method of claim 35, wherein the random distribution for at least one of said input parameters is the same as said random time delays.

44. The method of claim 35, wherein the selection of sound event parameter values for each simpler sound event is triggered in response to the triggering of that sound event.

45. The method of claim 35, wherein multiple sequences of different simpler sound events are generated with respective random time delays after a simpler sound event is generated until the next simpler sound event is generated for each said sequence.

46. The method of claim 45, wherein the generation of said multiple successions of different simpler sound events is triggered repeatedly in accordance with a random trigger sequence.

47. The method of claim 1, wherein said random time delays are independent of the durations of said simpler sound events.

48. The method of claim 35, wherein said random time delays are independent of the durations of said simpler sound events.

49. A method of synthesizing a complex sound, comprising:

generating a plurality of different kinds of simpler sound events in a sequence of simpler sound events with respective delays between the trigger times of successive simpler sound events in said sequence, and with repetitive occurrences of each kind,

establishing respective time delays between the trigger times of at least some of said kinds of simpler sound events independent of the durations of said simpler sound events, and independent of the kinds of simpler sound

events embodied by said at least some simpler sound events, and

combining said simpler sound events into said complex sound.

50. A method of synthesizing a complex sound event, comprising:

generating a succession of simpler sound events with random time delays, after a simpler sound event is generated until the next simpler sound event is generated, that are independent of the respective durations of said simpler sound events,

controlling said simpler sound events in accordance with one or more sound event parameters, and

selecting the values of said sound event parameters in accordance with respective input parameters that have random distributions.

(9) Evidence Appendix

None.

(10) Related Proceedings Appendix

None.